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Forest Insect and Disease Management

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BIOLOGICAL
EVALUATION R2-77-22

Shoestring Root Rot in
a Lodgepole Pine Stand

Poudre Ranger District
Arapaho and Roosevelt
National Forest

JUNE 1977

Rocky Mountain Region

U.S. Department of Agriculture Forest Service

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Shoestring Root Rot in a Lodgepole Pine Stand

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PREPARED BY:

David W. Johnson
Plant Pathologist, FI&DM

Frank G. Hawksworth
Project Leader, Rocky Mountain
Forest and Range Experiment Station

APPROVED BY:

G. L. DOWNING
Staff Director
Forest Insect and Disease Management

F. A. DORRELL
Deputy Regional Forester
State and Private Forestry

Forest Insect and Disease Management
State and Private Forestry
Rocky Mountain Region
USDA Forest Service
11177 W. 8th Avenue
Lakewood, Colorado 80225

INTRODUCTION

In the late 1950's and early 1960's, shoestring root rot, incited by *Armillariella (Armillaria) mellea* (Vahl. ex Fr.) Karst. damage was very noticeable in young lodgepole pine stands throughout northern Colorado and southern Wyoming (U. S. Forest Service 1960, 1961). To monitor the long-term effects of the disease, data was gathered by Frank G. Hawksworth, RMFRES, beginning in 1959 in a 13-year-old stand of reproduction, approximately 25 acres in size, near Buckhorn Ranger Station (T7N, R73W, Section 20) in the Poudre Ranger District, Arapaho and Roosevelt National Forests. To evaluate the effects of the disease after 18 years, the stand was re-examined in 1977 by Hawksworth and David W. Johnson, FI&DM.

Shoestring root rot is an important root disease of many tree species throughout the world (Raabe 1962; Leaphart 1963). Trees in all vigor classes are affected, but infection appears to be greatest in trees of low vigor. Impact from the disease is expected to increase on poor sites and in non-indigenous tree plantings; however, additional information is needed on losses in naturally regenerated stands.

Reports of the impact of the disease in ponderosa pine stands are conflicting (Johnson and Thompson 1975; Shaw et. al. 1976; Weiss and Riffle 1971). The fungus is invariably present in natural and planted stands; the stumps and roots of the previous crop trees provide the necessary substrate for the proliferation of the fungus. In the early stages of coniferous regeneration usually only scattered trees are killed, but mortality can increase up to about the time of first thinnings (Baranyay and Stevenson 1964). As stands grow older, mortality usually decreases as host stumps and roots deteriorate.

Persistent and increasing damage to stands has been reported by Shaw, et. al. (1976); however, this situation may be an exception and may relate to stand structure, logging history and aggressiveness of the particular *A. mellea* cone.

With the increase in stand management activity through precommercial and commercial thinnings and subsequent creation of potential host substrate in the form of stumps, roots and debris, it is imperative to advance our knowledge on this particular root pathogen.

The purpose of this evaluation was to determine whether or not the disease was causing sufficient loss to be of concern to management.

Land managers need this information to determine the priority of units for thinning operations. Secondly, it was hoped that the information gathered during this survey would provide some indication of the relative importance of the disease in the Rocky Mountain Region.

PREVIOUS SURVEYS

In 1959, the area was traversed at regular intervals. Survey strips were 10 chains apart and 0.01 acre plots located at 1 chain intervals along the transects. Sixty-three permanent plots, of varying size, were located within disease centers so annual progression of the disease could be determined. Plots were examined annually by Hawksworth for the subsequent five years when it became apparent that *A. mellea* losses were declining. These data are summarized below:

Percent of Pines Killed by *A. mellea*

Year	Annual	Cumulative Total
1959	---	6.4
1960	1.9	8.3
1961	1.3	9.6
1962	0.8	10.4
1963	0.8	11.2
1964	0.4	11.6

Root-rot losses in 1959 were very striking. Disease centers had from one to as many as 45 killed trees and averaged eight. Annual mortality was nearly two percent in 1960 but this declined to less than 0.5 percent four years later.

1977 SURVEY

Tree loss within the stand in 1977 was estimated by traversing the stand at regular intervals, as was done in 1959. A series of 84, 0.01 acre plots were located at 1 chain intervals along transects 10 chains apart through the stand. All trees over 3 feet tall were tallied as to condition (live, dead or infected with *A. mellea*). Cause of death was determined by examining the root collar area of each dead tree for the characteristic mycelium of the fungus. Average stand diameter was estimated by recording the diameter of one tree nearest plot center on 25 percent of the plots.

RESULTS AND CONCLUSIONS

The 31-year-old stand had an average diameter of 4.3 inches; site index was 50; average height of dominant trees was 23 feet. A total of 1,085 trees (1,292 trees/acre) were examined during the survey and only 40 were killed (48 trees/acre) by *A. mellea*. All the dead trees examined were suppressed and thus would not have been selected as crop trees. None of the disease centers were large enough to result in understocking of the stand, thus it is believed the disease has had minimal impact on the stand. Even the infection center that had 45 dead trees in 1959 was adequately stocked.

The apparent decrease in disease activity since the earlier surveys is probably the result of deterioration of stumps and roots which served as the original food base for the fungus. Increased competition from saprophytic fungi in stumps may have affected the aggressiveness and viability of *A. mellea* inoculum.

Additional work is needed on the status of the fungus, particularly longevity of inoculum under various conditions, in stumps resulting from thinning and harvest operations before we can predict the hazard posed by *A. mellea* to management.

At this time, however, there appears to be no reason for delaying thinning in overstocked lodgepole pine stands infected with a low level of *A. mellea*.

REFERENCES

Baranyay, J. A. and G. R. Stevenson. 1964. Mortality caused by Armillaria root rot, Peridermium rusts and other destructive agents in lodgepole pine regeneration. For. Chron. 40: 350-361.

Johnson, D. W. and J. H. Thompson. 1975. Effect of precommerical thinning on ponderosa pine, *Pinus ponderosa*, infected with *Armillaria mellea*. Plant Dis. Reptr. 59: 308-309.

Leaphart, C. D. 1963. Armillaria root rot. USDA Forest Service, Forest Pest Leaflet 78, 8 pp.

Raabe, R. D. 1962. Host list of the root fungus *Armillaria mellea*. Hilgardia 33(2): 25-28.

Shaw, C. G. III, L. F. Roth, L. Rolph and J. Hunt. 1976. Dynamics of pine and pathogen as they relate to damage in a forest attacked by *Armillaria*. Plant Dis. Reptr. 60: 214-218.

USDA Forest Service. 1960. Root rot kills young lodgepole pine. Rocky Mountain Forest and Range Experiment Station, Annual Report 1959, 60 pp.

USDA Forest Service. 1961. Root rot continues to damage young lodgepole pine. Rocky Mountain Forest and Range Experiment Station, Annual Report 1960, 16 pp.

Weiss, M. J. and J. W. Riffle. 1971. Armillaria root rot in a ponderosa pine plantation in New Mexico. Plant Dis. Reptr. 55: 823-824.